(GC) are interchangeable; however, the molecular differences driving tumorigenesis for these cancers remain poorly defined. The present study utilized biomarker analysis of actionable targets for IHC and GC to distinguish them and potentially refine current treatment strategies.
217 IHC and 28 GC specimens referred to Caris Life Sciences between 2009 thru 2012 were evaluated. Specific testing by immunohistochemical analysis for 17 different biomarkers was performed. In the collective cohort (n = 245), actionable targets included: 95% low TS, 82% low RMM1, and 74% low ERCC1, indicating potential susceptibility to fluoropyrimidines/capecitabine, gemcitabine, and platinum agents, respectively. Additional non-NCCN compendium targets included TOPO1 (53.3% high, irinotecan), MGMT (50.3% low, temozolomide), TOP2A (33% high, anthracyclines), and PGP (30.1% low, taxanes). Subgroup analysis by tumor origin demonstrated a differential biomarker expression pattern with a higher frequency of IHC tumors showing low levels of TS (99% vs. 72%, $p < 0.0001$), and RRM1 (85% vs. 64%, $p = 0.021$) when compared to GC. Conversely a greater frequency of GC demonstrated high levels of TOPO1 (76% vs. 50%, $p = 0.018$) versus IHC, indicating a potential increased benefit from irinotecan. Biomarker analysis possesses the capacity to identify additional targets for which established agents are available. Differences in molecular profiles of IHC and GC provide evidence that the two are distinct diseases and require different treatments.

FRIDAY, MARCH 13, 2015, 12:30PM–1:00PM LUNCH VIDEO PRESENTATION

VL.01 TRANS-THORACIC MINIMALLY INVASIVE SEGMENT 8 LIVER RESECTION GUIDED BY AUGMENTED REALITY

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Background: Liver dome tumors are not traditionally amenable to minimally invasive hepatectomy (MIH) due to superior/central location. In order to increase the number of lesions amenable to MIH, new approaches are needed. Additional challenges in MIH include loss of 3D visualization and tactile perception for intraoperative guidance within the intra-hepatic anatomy.
Methods: This video includes the use of a pre-operative 3D virtual model and intra-operative augmented reality (AR) navigation to facilitate trans-thoracic MIH of the liver dome.
Results: We present a 52 year-old gentleman with a 3 cm isolated hepatocellular carcinoma in segment 8. A trans-thoracic approach was chosen to allow for MIH. The video begins with presentation of 3D reconstruction and virtual resection planning. Principles of AR are detailed. The surgical steps include positioning and triangulation of thoracic ports under AR guidance, followed by trans-diaphragmatic tumor localization, identification of the phrenotomy site, and planning of margins using intra-operative ultrasound combined with AR. The parenchyma is transected with bipolar radiofrequency ablation and ultrasonic scalpel. After closure of diaphragm, the specimen is extracted through an enlarged thoracic port, and a chest tube is placed. The procedure was well tolerated. The chest tube was pulled on day 3 and discharge occurred on day 4.
Conclusion: This video of liver resection for challenging tumor localization illustrates a different, safe, and valuable approach to MIH. It highlights how 3D virtual resection planning and AR can enhance and facilitate complex MIH, thereby easing the transition into the minimally invasive era for liver surgery.

FRIDAY, MARCH 13, 2015, 3:00PM–4:30PM LONG ORAL A – PANCREAS ONCOLOGY

LO-A.01 UTILITY OF ESTABLISHING A PANCREAS CANCER SCREENING PROGRAM WITHIN A HIGH VOLUME PANCREATIC CANCER PROGRAM

B. A. Krzywda, S. M. Lahiff, D. M. McDowell, B. George, P. S. Ritch, B. A. Erickson, F. M. Johnston, K. K. Christians, D. B. Evans, S. Tsai
Medical College Of Wisconsin, Milwaukee, WI

Background: Approximately 10% of pancreatic cancer (PC) may be hereditary and screening of high risk individuals has been recommended. Herein we describe the establishment of a comprehensive multidisciplinary screening program.
Methods: Screening criteria included the presence of PC in: 2+ first-degree relatives (FDR), or 3+ any degree relatives (ADR), or any known hereditary cancer syndrome with increased PC risk. Lifetime PC risk was calculated using the CancerGene PancPro software. The clinic provided genetic counseling and nutrition/wellness education. MRI imaging was selectively recommended based the lifetime PC risk.
Results: Forty-three patients were screened; 65% were female and the median age was 54 (IQR:11). Family history was significant for two FDR in 12 (28%) patients and three ADR in 11 (26%). Median age of the earliest affected family member with PC was 59 (IQR:15). Hereditary cancer syndromes were present in 18 (41%) patients: BRCA1(3), BRCA2(6), MLH1(1), PMS2(1), PALB2(1), ATM(1), CDKN2A(4) and STK11(1). Median PancPro estimated lifetime risk of screened patients was 7% (IQR:6). Twenty-two (51%) of 43 patients had a lifetime risk over 10%. Elevated

CA19-9 or HbA1c was detected in 2 (5%) and 4 (9%) patients, respectively. Screening MRI was obtained in 37 (86%) of 43 patients and 10 (27%) of the 37 had pancreatic cystic lesions. No patient has undergone surgical resection of a pancreatic lesion.

Conclusions: Initiation of a high risk PC screening clinic identifies patients with radiographic or biochemical abnormalities for which surveillance is necessary. Guidelines for the frequency of surveillance and indications for surgery are needed.

LO-A.02 **HAS SURVIVAL IMPROVED FOLLOWING RESECTION FOR PANCREATIC ADENOCARCINOMA?**

A. S. Rosemurgy, R. Klein, C. Ryan, P. Sukharmwala, B. Sadowitz, K. Luberice, S. B. Ross
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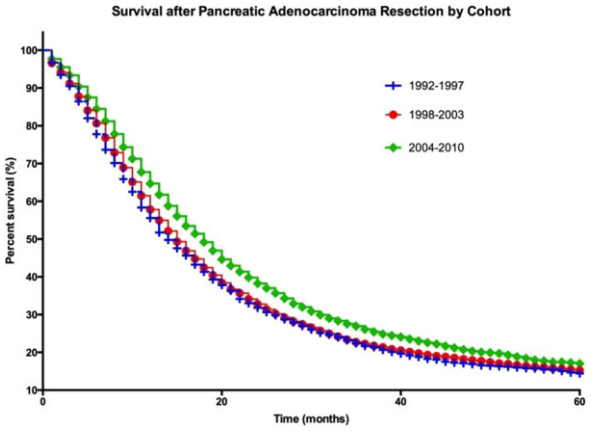
Introduction: Billions of dollars have been spent on the research and treatment of pancreatic cancer. This study was undertaken to determine if survival after resection of pancreatic adenocarcinoma has been extended over the past two decades.

Methods: The SEER database was queried for patients who underwent pancreatectomy for pancreatic adenocarcinoma from 1992 through 2010. AJCC Stage and survival were determined for each patient. Data were analyzed using Mantel-Cox test and linear regression. Significance was accepted at $p < 0.05$.

Results: 15,604 patients underwent pancreatectomy from 1992 through 2010. Survival improved from 1992 through 2010 ($p < 0.0001$), as denoted in Figure 1 with the patients divided into three cohorts for illustrative purposes (1992–97, N = 1,846; 1998–2003, N = 4,528; 2004–10, N = 9,230). Similarly, median survival increased 1992 through 2010 (14 vs. 15 vs. 18 months for the cohorts, $p < 0.0001$). However, 5-year survival rates did not change 1992 through 2010 (14.4% vs. 15.2% vs. 17.0% for the cohorts; $p = 0.07$). More patients ($p = 0.007$) and relatively more patients ($p = 0.004$) underwent resections of Stage I and Stage II cancers 2004 through 2010 with commensurately smaller tumors ($p = 0.01$).

Conclusions: From 1992 through 2010, progressively more patients underwent pancreatectomy for pancreatic adenocarcinoma with progressively smaller tumors and earlier stages. These patients lived more years (e.g., improved survival curves and median survival) but without improved 5-year survival, denoting better early and intermediate survival. Early detection, better perioperative care, more efficacious noncurative chemotherapy undoubtedly play a role, but better solutions for long-term survival must be sought.



LO-A.03 **HIGH-GRADE INTRADUCTAL PAPILLARY MUCINOUS NEOPLASM IS NOT MALIGNANCY**

N. Rezaee[1], J. He[1], B. Salman[1], R. H. Hruban[2,3], J. L. Cameron[1], N. Ahuja[1,2], A. Lennon[1,4], M. J. Weiss[1,2], L. D. Wood[3], C. L. Wolfgang[1,2,3]
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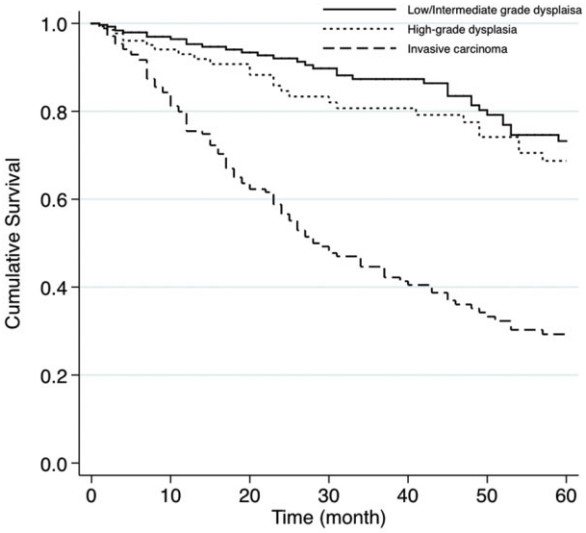
Background: Since identification of intraductal papillary mucinous neoplasm (IPMN) in 1996, high-grade dysplasia and IPMN-associated invasive carcinoma was used frequently under the umbrella term "malignancy". We aimed to compare the pathological features and survival outcomes of high-grade IPMN to invasive carcinoma.

Patients and Methods: From 1996 to 2013 data of 616 patients who underwent pancreatic resection for an IPMN were reviewed. IPMNs were classified as low/intermediate-, high-grade dysplasia (HGD), and invasive carcinoma.

Results: A total of 293 (48%) patients diagnosed with low/intermediate-grade dysplasia, 140 (23%) with HGD, and 183 (30%) with invasive carcinoma. Actual 5-year survival was 55% for the entire cohort. The median overall survival was 94 months for HGD, which was similar to low/intermediate-grade IPMN (118 months, $p = 0.07$), and superior to invasive carcinoma (29 months, $p < 0.001$) (figure). Invasive carcinoma was associated with regional lymph node metastasis in 34%, perineural invasion in 38%, and vascular invasion in 38%. In contrast no lymph node metastasis, perineural or vascular invasion was observed after resection of HGD. Compared to invasive carcinoma, HGD was associated with a lower rate of positive margin (38% vs. 24%, $p = 0.007$). Among patients who had more than 6 months follow-up, the recurrence rate after resection of HGD (16%) was similar to low/intermediate dysplasia (19%, $p = 0.50$); and was lower compared to invasive IPMN (29%, $p = 0.03$).

Conclusion: IPMN with high-grade dysplasia has a favorable survival outcome and a lower rate of recurrence after resection compared to IPMN-associated invasive carcinoma, and thus should not be considered a malignant entity.



LO-A.04 **IRREVERSIBLE ELECTROPORATION (NANOKNIFE) FOR PANCREATIC CANCER: A SINGLE INSTITUTION SERIES OF 50 CONSECUTIVE PATIENTS**

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Introduction: The NanoKnife® irreversible electroporation system (IRE) uses electrical energy to destroy neoplastic tissue invading surrounding neurovascular structures. Large scale IRE for pancreatic cancer has yet to be reported. This study examines a large cohort of IRE-treated pancreatic cancer patients to evaluate the safety of this novel surgical approach.

Methods: Data was abstracted on all T3 and T4 pancreatic cancer patients who underwent IRE at a tertiary hepatobiliary unit from 2012–2014. Standard statistical methodology was used.

Results: 50 consecutive patients were treated with IRE by 3 pancreatic surgeons, with 36(72%) cases performed by a single surgeon. Mean patient age was 65.8 ± 7.8 years, with 31(62%) male patients. There were 45(90%) adenocarcinoma cases, most commonly involving the pancreatic head (n = 16;32%) or body (n = 16;32%). IRE was used for primary local control in 25(50%) cases and margin ablation in 21(42%). Median survival was 11.8 ± 6.2 months. Median follow-up was 7.8 ± 9.6 months, with length of stay 7.34 ± 5.6 days and readmission rate of 20%(n = 10). 30- and 90-day complication rates were 36%(n = 18) and 6%(n = 3), most commonly portal vein thrombosis(n = 4;8%), intra-abdominal collection(n = 3;6%), and anemia requiring transfusion(n = 3;6%). Overall mortality attributable to IRE was 6%(n = 3). 3 additional mortalities were related to disease progression.

Conclusions: IRE offers a feasible technique to manage advanced pancreatic cancer. To reduce morbidity and mortality, anticoagulation should be considered when performing IRE near the portal vein, and plastic stenting should be considered when performing IRE near the common bile duct. IRE is a potentially crucial tool in the arsenal of surgeons treating otherwise inoperable pancreatic cancer.

Table 1. Demographic and Clinical Profile of 50 Consecutive Pancreatic Cancer Patients Treated with Irreversible Electroporation (2012-2014)

		n	%
Mean Age		65.8 ± 7.8 years	
Age groups	50-59	11	22.0%
	60-69	23	46.0%
	70+	16	32.0%
Gender	Female	19	38.0%
	Male	31	62.0%
Diagnosis	Adenocarcinoma	45	90.0%
	Adenocarcinoma and Neuroendocrine tumor	1	2.0%
	Neuroendocrine tumor	3	6.0%
	IPMN	1	2.0%
Tumor Location	Head	16	32.0%
	Neck	9	18.0%
	Body	16	32.0%
	Uncinate Process	5	10.0%
	Diffuse	4	8.0%
Mean Tumor Size		3.22 x 2.31 x 1.96 cm	
Tumor Grade	Unknown	24	48.0%
	Well Differentiated	5	10.0%
	Mod Differentiated	9	18.0%
	Poorly Differentiated	12	24.0%
Vascular Involvement	Negative	12	24.0%
	Positive	38	76.0%
Neural Involvement	Negative	33	66.0%
	Positive	17	34.0%
Recurrent Tumor	Non-recurrent	42	84.0%
	Recurrent	8	16.0%
Type of Surgery	Nanoknife only	25	50.0%
	Nanoknife and whipple	14	28.0%
	Nanoknife and distal pancreatectomy	10	20.0%
	Nanoknife and Appleby procedure	1	2.0%
Purpose of Nanoknife	Primary Local Control only	25	50.0%
	Secondary Recurrence ablation	4	8.0%
	Margin Ablation	21	42.0%
Resection Margins	Negative	25	50.0%
	Positive	9	18.0%
	Gross Disease	16	32.0%
Portal Venous Resection	Not Performed	36	72.0%
	Performed	14	28.0%
Median Survival		11.8± 6.2 months	
Median Follow-up Time		7.8± 9.6 months	
Readmission	No readmission	40	80.0%
	Readmitted	10	20.0%
Mean Time to Readmission		30.25 ± 20.6 days	
Mean Length of Hospital Stay		7.34 ± 5.6 days	
30-Day Clavien-Dindo Complication Grade	0	32	64.0%
	Grade1	5	10.0%
	Grade 2	4	8.0%
	Grade 3a	3	6.0%
	Grade 3b	2	4.0%
	Grade 4	1	2.0%
	Grade 5	3	6.0%
90-Day Clavien-Dindo Complication Grade	0	47	94.0%
	Grade 3	1	2.0%
	Grade 5	2	4.0%
Overall Clavien-Dindo Grade 3 or Higher Complications	None	39	78.0%
	Present	11	22.0%
Mortality	Alive	42	84.0%
	Dead	6	12.0%

LO-A.05 **PRETREATMENT SERUM CA 19-9 LEVELS IN PATIENTS WITH LOCALIZED PANCREATIC CANCER TREATED WITH NEOADJUVANT THERAPY**

M. Aldakkak, K. K. Christians, A. N. Krepline, B. George, P. S. Ritch, B. A. Erickson, F. M. Johnston, D. B. Evans, S. Tsai

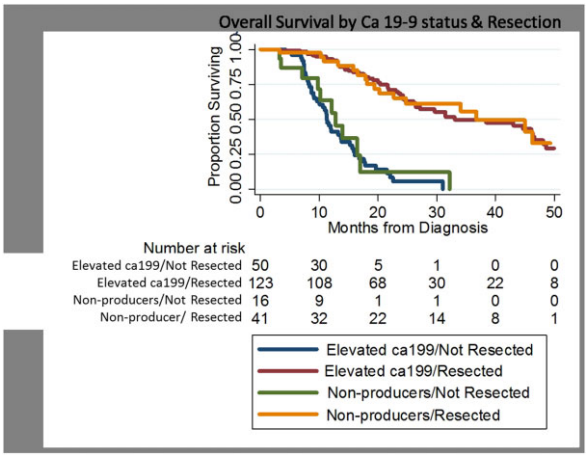
Medical College Of Wisconsin, Milwaukee, WI

Background: Among pancreatic cancer (PC) pts treated with a surgery-first approach, normal CA19-9 levels have been associated with improved survival. The impact of neoadjuvant therapy on this association is unknown.

Methods: Localized PC pts with a CA19-9 level prior to neoadjuvant therapy were dichotomized into two groups; low CA19-9 and elevated CA19-9 based on a cutoff of 36 U/mL.

Results: CA19-9 was evaluable in 230 pts prior to any treatment; 57 (25%) were low and 173 (75%) were elevated. The median CA19-9 level at diagnosis in low and elevated CA19-9 pts was 14 (IQR:23) and 267 (IQR:594) respectively. Neoadjuvant therapy including successful surgery was completed in 164 (71%) of the 230 patients; 41 (72%) of 57 low CA19-9 and 123 (71%) of 173 elevated CA19-9 pts (p = 0.90). Median survival of all 230 pts was 23.8 months; 36.7 months for the 164 pts who completed all therapy

including surgery vs. 11.7 months for the 66 pts not resected. Among the 164 pts who completed all therapy, no difference in median survival was observed between low CA199 and elevated CA19-9 pts; 36.7 months vs. 33.1 months, p = 0.89. **Conclusions:** An elevated CA19-9 at diagnosis did not predict a failure to complete neoadjuvant therapy and was not associated with inferior survival. These data suggest two cautionary notes: an elevated CA19-9 at diagnosis should not be considered synonymous with advanced (non-surgical) disease; and, a low/normal CA19-9 should not be interpreted as a predictor of favorable outcome (and used to justify a surgery first strategy).



LO-A.06 ONE YEAR EXPERIENCE OF CHARACTERIZATION OF GENETIC RISK IN A HIGH-RISK PANCREATIC CLINIC

K. Flores, K. Dinh, E. Rouleau, W. Wassef, J. LaFemina
University Of Massachusetts, Worcester, MA

Background: Despite the established benefit of early detection in pancreatic cancer (PDAC) prognosis, high-risk pancreatic clinics are less common than their breast or colon counterparts. One of the difficulties of establishing a high-risk clinic is delineating which individuals are "high-risk."
Methods: We retrospectively examined patients referred for genetic counseling for PDAC from January 2009-June 2014. Patients were referred for a personal and/or family history of PDAC or a potential diagnosis of hereditary pancreatitis (HP).
Results: 75 patients were referred for genetic counseling; 36 underwent testing. Twelve (33%) mutation carriers were identified, demonstrating a positivity rate higher than in high-risk clinics for other malignancies. The most common reason to decline testing was lack of insurance. 11% of patients with a family history of PDAC were found to carry a mutation. 20% of those a personal history of PDAC were found to carry a mutation. Ten of 43 patients with a personal history of chronic pancreatitis were found to carry ≥1 mutations. Of these, 8 were heterozygous for CFTR mutations, 1 was CFTR homozygous, and 1 was homozygous for SPINK1 mutations.
Conclusion: This study illustrates criteria for the highest yield of genetic evaluation for high-risk of PDAC. Insurance coverage for unaffected relatives is lacking. Identification of a causative mutation in an affected family member allows for cost-effective targeted testing in at-risk relatives. Individuals with apparently idiopathic pancreatitis, onset of pancreatitis < 30 years, and those with a family history of pancreatitis or PDAC are candidates for genetic evaluation.

FRIDAY, MARCH 13, 2015, 3:00PM–4:30PM
LONG ORAL B – LIVER HCC

LO-B.04 SURGICAL RESECTION VERSUS ABLATION FOR HEPATOCELLULAR CARCINOMA LESS THAN 3CM: A POPULATION BASED ANALYSIS

J. T. Miura, R. T. Groeschl, F. M. Johnston, S. Tsai, K. K. Christians, K. K. Turaga, T. C. Gamblin
Medical College Of Wisconsin, Department Of Surgery, Milwaukee, WI

Background: Ablation for ≤3 cm hepatocellular carcinoma (HCC) has been demonstrated to be an effective treatment strategy. Whether ablation achieves a similar survival benefit as compared to surgical resection for early stage HCC remains ill defined. The present study sought to examine the outcomes of patients with ≤3 cm HCC following ablation versus resection.
Methods: Patients treated by ablation or surgical resection for ≤3 cm T1 HCC were identified from the National Cancer Database (2002–2011). Cox proportional hazards models were used to assess overall survival (OS) between treatment types (ablation vs resection) following adjustment for age, gender, alpha-fetoprotein (AFP), Charlson Comorbidity Score, and cirrhosis.
Results: A total of 2,855 patients underwent ablation (n = 1,984) or resection (n = 871) for solitary HCC ≤3 cm. The median age of the collective cohort was 61 (IQR: 55–70) with the majority being male (n = 2,007, 70.1%). Patients treated with ablation as compared to resection had a higher frequency in AFP elevation (46.5% vs 39%, p < 0.01) and presence of cirrhosis (22.2% vs 14.9%, p < 0.01). Unadjusted OS at 3 and 5 years was greater following resection (67%, 55%) versus ablation (52%, 36%, p < 0.01). In multivariable models, resection was independently associated with improved OS (HR: 0.65, 95% CI: 0.51–0.83; p < 0.01).
Conclusion: While more invasive, resection of HCC ≤3 cm results in better long-term survival as compared to ablation. Treatment strategies for small solitary HCC should emphasize a resection first approach, with ablation being reserved for patients precluded from surgery.

[Correction added on 24 February 2015. Moved "LO-B.04 "SURGICAL RESECTION VERSUS ABLATION FOR HEPATOCELLULAR CARCINOMA LESS THAN 3CM: A POPULATION BASED ANALYSIS" before "LO-B.01".]